

Birth Defects & Hazardous Waste Sites

The US now has over 1400 Superfund sites—hazardous waste sites included on the Environmental Protection Agency's National Priority List for cleanup. Does living near one raise the risk for birth defects?

In this large study by the California Birth Defects Monitoring Program, we interviewed mothers of babies with 3 common birth defects as well as mothers of healthy infants—over 2000 women in all.

Using address during the early months of pregnancy—when birth defects occur—we calculated distance from women's homes to hazardous waste sites. Many Superfund sites are military bases; women residing on base were classified as living less than 1/4 mile away.

VERY CLOSE RESIDENCE RAISES RISK

Women who lived within 1/4 mile of a Superfund site during the first 3 months of pregnancy had a greater risk of having babies with certain birth defects:

- **Conotruncal heart defects**, a group of serious heart defects, were 4 times as likely (increasing from 1/1000 to 1/250 babies.)
- **Neural tube defects**—spina bifida and anencephaly—were 2 times as likely (increasing from 1/1000 to 1/500 babies.)

- **Cleft lip and cleft palate** occurred no more frequently than expected.

Women who lived farther than 1/4 mile from sites were not at higher risk.

FEW WOMEN LIVE NEAR SITES

How many women are affected by the higher risk? Only 0.6% of the mothers interviewed lived within 1/4 mile of a Superfund site during early pregnancy. About half of these women lived on military bases.

FEW BIRTH DEFECTS CASES NEAR SITES

Hazardous waste sites were a possible factor in only a small number of birth defects cases: 8 of the 507 babies with neural tube defects and 3 of the 201 babies

CALIFORNIA'S SUPERFUND SITES

- The US Environmental Protection Agency has identified 1430 hazardous waste sites on its National Priority List for cleanup, often called Superfund sites. 105 are located in California.
- Sites include inactive pesticide and chemical manufacturing plants, wood processing facilities, drum storage sites, contaminated ground-water areas, sanitary landfills, and mines.
- Military bases make up 20% of California's Superfund sites.

with heart defects were born to mothers living within 1/4 mile of Superfund sites.

IMPLICATIONS

- The very small number of cases around hazardous waste sites means the findings do not have strong statistical power. However, they do support earlier research hinting at higher risk.
- Study findings—the higher risk for certain birth

defects among those living within 1/4 mile of Superfund sites—are relevant as communities plan development around hazardous waste sites or re-use of these sites.

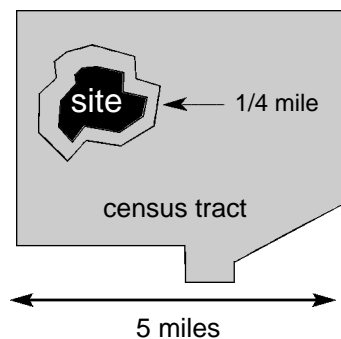
- Larger studies of hazardous waste sites are not likely to yield more definitive answers, particularly without better exposure information. Future studies should incorporate direct measures of specific exposures.

STUDYING HAZARDOUS WASTE SITES

Any study of hazardous waste sites faces numerous challenges. This study has several distinguishing features that strengthen findings:

- **Size.** Drawn from a population of over 1 million births, it is the largest ever study of its type.
- **Timing.** The study considered residence in early pregnancy—when birth defects occur—rather than at the time of delivery.
- **Proximity.** Actual distance from women's homes to site boundaries was calculated. In studies classifying residence by census tract or zip code, the dwelling may be many miles from the site.
- **Site contents.** Information was available on chemicals/conditions at the Superfund sites.
- **Non-Superfund sites.** The study also took into account whether women lived near hazardous waste sites not on the National Priority List.
- **Specific outcome.** This study looks at distinct conditions rather than grouping all types of birth defects. Factors that raise risk for one type of birth defect may not influence another; combining diverse conditions may mask results.
- **Other risk factors.** Is the waste site itself related to birth defects or is there something different about those living nearby which puts them at higher risk? Interviews provided information on characteristics such as race/ethnicity, income, cigarette smoking, and multivitamin use. These other factors did not explain the extra risk.

A central problem in any study of hazardous waste sites is defining "exposure." A woman living near a site may not actually have contact with its contents—airborne contamination diffuses quite rapidly as it travels from its source; groundwater contamination may never reach drinking water supplies. In most studies of residence near hazardous waste sites, including this one, no measurements to document or rule out exposure were made.



Past studies of hazardous waste sites often classified residence by census tract or zip code. This can muddy results by combining women who have higher risk—those living within 1/4 mile of the site—with those living farther away whose risk is not increased. Future studies should focus on documenting exposures—this will require better techniques for precisely measuring contaminants.

DATA SOURCES

The women in this study were interviewed as part of 2 case-control studies. Mothers of children with birth defects were identified from the California Birth Defects Monitoring Program population-based registry; mothers of children without birth defects were randomly selected from those who gave birth around the same time.

- **Neural tube defects study:** Interviews with mothers of 507 fetuses and infants with neural tube defects (83% of those identified) and 517 mothers of infants without birth defects (85% of those identified). Subjects were drawn from more than 708,000 births from June 1989 to May 1991. Interviews were conducted in English or Spanish, usually within 5 months of the due date.
- **Heart defects/oral clefts study:** Interviews with mothers of 201 infants with conotruncal heart defects (84% of those identified), 439 mothers of infants with cleft lip and/or cleft palate (82% of those identified), and mothers of 455 infants without birth defects (72% of those identified). Subjects were drawn from more than 344,000 births from January 1987 to December 1988. Interviews were conducted in English or Spanish within 4 years of the delivery date.
- **Area/population studied:** Reflects registry coverage during the study period and the other exposures being investigated in the 2 case-control studies. We identified mothers based on where they gave birth—all parts of California except the metropolitan Los Angeles area (neural tube defects study) or the greater San Francisco

and Los Angeles areas (heart defects/oral clefts study). However, waste sites in these urban regions were considered if interviewed women lived nearby during early pregnancy.

REFERENCE: Croen LA, Shaw GM, Sanbonmatsu L, Selvin S, Buffler PA. Maternal residential proximity to hazardous waste sites and risk for selected congenital malformations. Epidemiology 1997;8(4):347-354.

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